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nearer, he is off with a scream that makes the woods echo his triumphant disdain. It will be of no use to follow him, now that he is alarmed ; give up the hope of that particular skin for your cabinet. But perhaps on another occasion he may be inclined to take a better look at you, for his curiosity is great, and so he may expose himself through the rift of the foliage that forms his lookout. That moment is your chance, and with the loud report of the gun comes his shriek of agony, as he falls all bloody from the bough he just mounted in such pride. If he is only wounded, you will find him game to the last, in such desperate strait as this, however he may show the white feather at other times ; and you will have hard work to squeeze the last gasp out of him, with your fingers pressed on each side of the thorax, as you well know how. And even though you have a prize, you will think it is a cruel thing to do, as you plug up the shot holes, and thrust him in a stiff paper cone — especially guarding his superb crest — before consigning his warm body to the bag along with other victims.

REVIEWS.

GRAY'S HAND LIST OF BIRDS.—With the third Part, which has appeared this year, one of the most remarkable ornithological works ever published is brought to a close. The urgent need of such a work as this has long been felt, while there seemed to be little hope that the want would be supplied, owing to the magnitude and exceptional difficulty of the task. Since Bonaparte's 'Conspectus,' with somewhat similar aim and scope, was abruptly broken off by the author's death, no one has hitherto been found willing, even if able, to bend himself to the undertaking. But Mr. Gray has proved equal to the occasion. To a knowledge of birds possessed by only a few leading ornithologists, he adds an acquaintance with the literature of the subject in which perhaps he stands alone ; while the British Museum affords unrivalled facilities for one, who, like Mr. Gray, can use them to greatest advantage. To speak of the work in general terms of praise would be entirely superfluous. Mr. Gray has laid ornithologists under a lasting debt of gratitude.

The three unpretentious volumes simply purport to be a "hand-list of birds, distinguishing those contained in the British Museum;" but this does not say what has been accomplished, nor more than hint at the immense labor involved. This astonishing compilation is really an epitome of ornithological literature. It undertakes to present and identify all the generic and specific names that have been proposed in ornithology from the Linnæan times to to-day. And when we find that some five thousand generic titles, and over thirty thousand specific names, have been collated and identified, either as synonyms or as valid designations, we can appreciate what has been done. The index alone (which, by the way, takes up more than half the last volume) presupposes a familiarity with the literature of the science hardly to be expected in one man, to say nothing of the library work required in looking up authorities, and the mere clerical labor of transcription. But even this seems insignificant, when we recollect that two-thirds of the thirty thousand "species" are synonyms, and that an equal if not greater reduction of the five thousand "genera" was required; that this great mass of bibliographical matter had to be thoroughly digested, the valid species to be sifted out and assigned to other proper sub-genera and genera, and then the load of synonymy to be correctly distributed. Yet this has been approximately accomplished.

It is not within the bounds of possibility that all this should have been faultlessly done. In the first place, ornithological synonymy cannot now be completely disentangled; in every family, and in every extensive genus, there are names that cannot be identified to everybody's satisfaction. Secondly, the number of species cannot be fixed, owing to the well-known and unfortunate lack of agreement as to what shall be held for species and what for geographical or other differentiation. Supposing a man to have arranged before him every name that has been printed in ornithology, and to be personally acquainted with the bird upon which each one of these names was based; yet then he would not be able to pass judgment that would not be contested or reversed by some other equally well informed ornithologist in at least one case out of ten. In such insurmountable difficulty as this, Mr. Gray has adopted the most judicious—in fact the only practicable—course; he gives doubtful species the benefit of the doubt. It was manifestly impossible for him to attempt, in his individ-

ual capacity, critical discrimination in every instance; and the plan carried out is far more satisfactory. Suppressing only unquestionable synonyms, he retains all names not satisfactorily identified, and enumerates separately all geographical and other differentiations, in the cases of widely spread and flexible species, that have been distinguished by name. So in any given group we see at a glance what has been described as distinct, and may so be held with any show of reason whatever. As each name is accompanied by precise indication of locality, we can seize at once upon a probable indication of any specimen we may be looking up; and after determining that it is such a species of such an author, it remains with ourselves to decide whether it is sufficiently distinguished from such another species. Thus any one inclined to be severe in the matter of species can lump to his heart's content; whereas had Mr. Gray heaped up synonyms in a conservative spirit, he would have made it like looking for a needle in a haymow for one of opposite tendencies to pick out the name he wanted. By this method, Mr. Gray makes an approximation towards a perfect mirror of ornithological literature only limited by common human fallibility.

The list of species foots up a total of eleven thousand, one hundred and sixty-two, distributed among two thousand, nine hundred and fifteen genera and sub-genera. Making a reasonable reduction, upon the considerations just presented, the number probably will not exceed ten thousand—a figure that accords with current estimates. But the number of “genera”—one for every four species, and that in a class of animals of the fewest broad types, and an unusual proportion of closely interrelated forms—is a palpable absurdity. Mr. Gray, however, is not guilty of any such thing as this. The full genera he adopts are noticeably few—decidedly fewer than is now customary; at a rough estimate not one-fifth of the two thousand, nine hundred and fifteen names enumerated. For in this matter, he has been guided by the same happy judgment that dictated his disposal of specific names. In reducing the five thousand and odd genera that have been proposed to two thousand, nine hundred and fifteen, he suppresses only those that are positively homonymous—based upon the same type. The rest are given, as subgenera, each over its own type, without raising the question of their taxonomic value; thus among the humming birds, we find only twenty-eight

genera, but no less than one hundred and seventy-eight subgenera! By this means we learn exactly what, if any, names have been based upon a particular species; and so knowing the types, we can combine or keep separate at discretion. If Mr. Gray had brought these various names under the one he adopted for the genus, we should be completely at a loss. One other reason for the prodigious number of generic names indexed, may be found in a peculiarity of Mr. Gray's; he invariably preserves the original spelling of names, whether correct or not, against the custom of the purists who try to amend cacography, false etymologies, and other 'barbarities' of which ornithology is guilty; he will not even correct typographical errors ordinarily; and by citing all the different spellings of the same word as distinct synonyms, his list is considerably swelled, since the same word is sometimes written five or six different ways. For the special purposes of this work, this method is undoubtedly preferable, though obviously it cannot be fully carried out. For instance, in the 12th edition of the *Systema Naturæ*, the genus *Scolopax* stands printed *Scopolax*.

The classification adopted in the hand-list is fairly open to criticism on every score. If there is any point upon which ornithologists are almost unanimous in the midst of the taxonomic enterprises and conflicts of the present day, it is the entire ineligibility of this antiquated classification. Whatever may be said for or against any other system, this one at least will not do.

We hesitate about mentioning the only other feature of the work that does not satisfy us; for it is much like asking the master of a feast why he does not have one more course. But, while a large proportion of the species (the leading ones in particular) are indicated by references to the works where they are described, the greater number of names, including all the synonyms, are merely accompanied by the authors' names, and the locality. This will often leave the student in the lurch, as he may have no idea where to look for the description upon which the name is based. This is complimentary to ornithologists, certainly: but it presupposes a knowledge of the literature of the science that all do not possess. It was not so much matter about the synonyms; but if the line allotted to each species had been filled out with the reference, as it might have been, we should judge that with little additional labor, and without perceptibly enlarging the volumes, the usefulness of the work would have been ma-

terially enhanced. After what has gone before, we hardly need say, that the Hand-list is simply indispensable to the working ornithologist. — E. C.

ORIGIN OF LOWEST ORGANISMS.*—The author's aim in this and other writings is to prove that while some monads (Bacteria) originate by subdivision of preëxisting individuals (homogenesis), others originate *de novo*, just as crystals originate by certain chemical laws. He thus goes still farther than those advocates of spontaneous generation who believe that Bacteria originate by the transformation of living matter (heterogenesis). For this new mode of spontaneous generation he proposes the term "Archebiosis."

We should premise that Bacteria are monads, the lowest and most minute organized beings, forming mere points of organized matter; they are highly refractive spherical bodies, and move with considerable activity. Torulæ are very similar bodies and are the germs of the yeast fungus. Professor Bastian has observed the ordinary reproduction by fission "most plainly when a few Bacteria have been enclosed in a single drop of fluid, pressed into a very thin stratum, in a 'live box' kept at a temperature of about 90° Fahr. by resting on one of Stricker's warm water chambers placed on the stage of the microscope. Under these conditions, I have seen a Bacterium of moderate size divide into two, and each of these into two others somewhat smaller, in the course of fifteen minutes." These monas-like bodies, as is well known, develop into higher organisms. "It is a fact, however, admitted by many, and which any patient microscopist is capable of verifying for himself, that some Bacteria do develop into Leptothrix filaments, and that these are capable of passing into a disseminated mycelial structure of larger size and undoubtedly fungus nature—from which, fructification of various kinds may be produced. Some Bacteria may therefore develop into some fungi, just as certainly as Torulæ may develop into some other fungi, or just as surely as some multiplying gonidia may develop into lichens. That some Bacteria are produced from preëxisting Bacteria, just as some Torulæ are derived from preëxisting Torulæ, may, it is

*The Mode of Origin of Lowest Organisms: including a discussion of the experiments of M. Pasteur, and a reply to some statements by Professors Huxley and Tyndall. By H. Charlton Bastian, London and N. York. Macmillan & Co. 1871. 12mo. pp. 109, with two cuts. \$1.25.